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Survey on ectoparasites of *Aphanius sophiae* (Cyprinodontidae) from Southern Iran

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PEER REVIEW

Peer reviewer

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Comments

This is a good study in which authors surveyed ectoparasites of *Aphanius sophiae* in Iran for first time. The results are valuable because infestation by *Lernaea* can lead to remarkable economic burden for fish farmers and also losing native fish. And findings suggested more investigations on different species of fish in different parts of the country. Details on Page 87

ABSTRACT

Objective: To determine the infestation of *Aphanius sophiae* (*A. sophiae*) with ectoparasite for the first time from Iran as a little attention has been paid to parasitic infection of *A. sophiae* which is an native species found in the endorheic Kor River Basin, Fars Province, Southern Iran.

Methods: A total of 70 *A. sophiae* (35 males and 35 females) were collected using dip net in May 2010 from Ghadamgah Spring-stream, Southern Iran. After fixation, the external surface of each fish was examined for ectoparasite through stereomicroscope.

Results: Out of 70 fish specimens, two females (2.86%) were infected with three *Lernaea* spp. copepod or anchor worm. The ectoparasite prevalence rate, intensity and abundance were estimated 2.860, 1.500 and 0.043 respectively.

Conclusion: This study reports infestation of *A. sophiae* by *Lernaea* spp. for the first time in Iran. Further parasitological investigations are required to determine ectoparasites of *A. sophiae* in different parts of Iran due to its importance and numerous epizootics occurring among the most important farmed fish in various parts of the world.

KEYWORDS

Ectoparasite, *Lernaea*, Iran, Copepode

1. Introduction

Aphanius sophiae (Heckel, 1849) (*A. sophiae*) or soffia tooth-carp is considered an endemic species in endorheic Kor River Basin[1]. In spite of importance of this fish species as a biologic control of anopheles mosquito larvae from streams, little attention has been paid to the parasitic infections and ectoparasite infestation, which actually will be enormously useful for conservation of this native fish[2]. So far, the infection of *A. sophiae* with *Tetracotyle* sp. has been reported[3]. *Lernaea* Linnaeus, 1746 (Cyclopoida: Lernaecidae) or anchor worm with about 40 described species are parasitic

on different species of freshwater fishes and mostly known from females[4].

Actually, the females attach into the fish with the aid of two large suckers and penetrate fish skin with sharp trunk-like mouth to feed on its blood then mate and the male die after copulation in the pre-adult stages, but the female differentiates into an adult with distinctive egg sacs at the posterior end. The head of *Lernaea* is buried in the flesh causing an inflamed red wound and only the worm-like body and twin egg-sacs are exposed. The adult parasites are particularly harmful to large fish because of their large size, mode of attachment and feeding[5].

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Lernaea species aggregate around the eyes, causing destruction of the lens and blindness or infect the gills and cause hyperplasia of epithelial tissues which may seriously interfere with respiration and also support spread of bacterial infection. Therefore, the economic importance of Lernaeid ectoparasites has increased due to numerous epizootics occurring among the most important farmed fish in various parts of the world[6].

Since, *A. sophiae* is a native species in Iran and the study of parasitic infection may help to conserve this species, therefore the first record of the occurrence of *Lernaea* parasite would have an important role in conservation of this cyprinodont inhabits in a natural environment.

2. Materials and methods

A total of 70 fish (35 males and 35 females) specimens of *A. sophiae* were collected from Ghadamgah spring, Kor River Basin, Fars Province, Southwest Iran (30°12'37.75"N., 52°26'25.11"E., Alt. 1660 m) in May 2010 using dip net. Fishes were fixed in 5% formalin solution. Total length of fishes was measured to the nearest 0.05 mm using vernier caliper and their sex was determined based on sex dimorphism. The external surface of each fish was examined through stereomicroscope to recognize the presence of ectoparasites. The parasites were removed with the fine forceps and placed in vials containing 5% formalin solution. Parasite was identified using keys discussed by Bykhovskaya–Pavlovskaya[7]. And prevalence, intensity and abundance of infection were estimated.

3. Results

The total mean length of examined fishes was 22.7–43.1 mm and out of 70 fish, two females were infected by three *Lernaea* sp. that one parasite was attached firmly to the base of anal fin in one fish (Figure 1 and 2) and two *Lernaea* parasites were attached to the base of pectoral fin and abdomen of other infected fish. The prevalence, intensity and abundance are 2.850%, 1.500%, and 0.043%, respectively.



Figure 1. Infected female of *A. sophiae*.

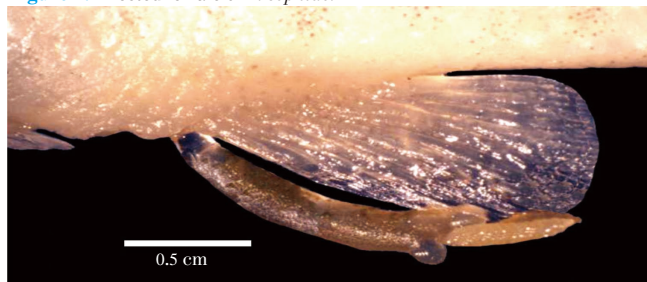


Figure 2. *Lernaea* sp. attached to the base of anal fin in *A. sophiae*.

4. Discussion

In the current study infestation rate of examined *A. sophiae* by ectoparasites was considerably low (2.85%). This low prevalence rate may originate from these facts that Ghadamgah is almost a clear and bright cold water spring with bottom composed of gravels and small stones and its water velocity is relatively high, therefore perhaps we should not expect having high infestation rate as it is consistent with our result[1]. Moreover, *A. sophiae* is a relatively fast swimmer inhabiting in this spring, thus it might have been less likely to infect by more copepodites of *Lernaea* parasite[8].

Variable parasitic prevalence and intensity is related to differences in ecological and behavioral adaptations, as fish collected from muddy water and bottoms are being more frequently infested with *Lernaea* parasite[9].

On one side, the low infestation in *A. sophiae* can be because of the small size of fish, as Tasawar et al. (2007) found intensity of infestation was correlated with the size of host and no Lernaeidae parasites was present on *Catla catla* with small size or minimum number of parasites was found in smallest fishes. Our findings are in agreement with this fact because total mean length of examined specimens was recorded 22.7–43.1 mm[10]. Perez–Bote showed that infestation of *Lernaea* is related to water temperature, water velocity and stream order[11].

On the other side, the low rate of infestation in *A. sophiae* may also be related to the biology of copepodites. Infective *Lernaea* copepodites are negatively photo tactic and thus would spend most of their time near the bottom, whereas *A. sophiae* swim near the surface of the water because of the adaptation of body and mouth shape to take the foods[12].

Different prevalence of *Lernaea* spp. were recorded including 21.66% of *Lernaea cyprinacea*, 15%–18% of *Lernaea polymorpha*, 4.16% of *Lernaea lophiara* and 2.14% of *Lernaea oryzophila* from *Catla catla* Muzaffargarh, Pakistan, also 6.33% of *Lernaea cyprinacea*, 2.18% of *Lernaea oryzophila* and 0.67% of *Lernaea lophiara* from *Ctenopharyngodon idella*, Pakistan[10,13].

In this study, parasite was recovered on the base of anal and pectoral fins and abdomen part of fish which is soft tissue and less scaly. Actually, these regions must confer some advantage to the parasite, such as protection from water current and also are easier to penetrate. Kabata (1981) reported that certain parasitic copepods are not only host–specific, but are also site–specific, a phenomenon determined by morphological and physiological factors of the host[14].

As parasites belonging to the genus *Lernaea* can have serious deleterious effects on their freshwater fish hosts such as acute haemorrhage and ulcers at the site of penetration, then death occurs as a result of blood loss and secondary infections[15,16]. Therefore it is necessary to recognize these parasites in order to conserve native fishes. Also, more urgent action is necessary to prevent the introduction of exotic fishes like *Gambusia* and cyprinids to this spring–stream system, because introduced fishes will impact on native fishes such as predation, competition and interference or transfer their parasites to native hosts.

In conclusion, the findings of the present study provide the first record of *Lernaea* sp. from *A. sophiae* in Iran. Further parasitological investigations are required in order to study and determine ectoparasitic fauna of *A. sophiae* in different parats of Iran due to their economical importance and conservation of native fishes.

Conflict of interest statement

We declare that we have no conflict of interest.

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Comments

Background

Lernaea species, copepod Crustacean are considered as parasite and pest in many types of freshwater fishes causing a considerable disease and mortality. They impose a considerable economic losses and damages for fish farmers throughout the world particularly in summer. They attach to the fish and then burrow deeply into the tissues and finally embed an anterior anchor into the fish's body. This wound which is caused by parasite can cause intense inflammation increasing the risk of infection by bacterial and fungal pathogens present in the water. Besides, a great numbers of *Lernaea* species can cause death in small fish by damaging their gills and making it hard for the fish to breathe properly.

Research frontiers

The cutting-edge in the field of the research in this paper was external examination of fish in order to define prevalence rate in this species in Iran. And low prevalence and intensity rate was important in this study.

Related reports

The paper results more or less are in agreement with infestation of fish including *Catla catla* and *Ctenopharyngodon idella* in Pakistan.

Innovations and breakthroughs

Albeit recently a lot of efforts by researchers have been made to survey on parasite infection of fish in Iran, a little information exists on ectoparasites of fish. The study increases our knowledge about fish ectoparasites particularly and their prevalence. And these studies identify the ectoparasite fauna of different species of fish in Iran.

Applications

It may be significant to know the prevalence of ectoparasite and their treats in *A. sophiae* in order to conserve this fish. Wounds owing to *Lernaea* should be closely monitored,

and optimal water quality should be considered to prevent secondary infections by bacterial and fungal agents.

Peer review

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